Energy Corridor Planning for Increased Electrical Grid Reliability

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2014 ESRI International User Conference
San Diego, CA

Session 459: Planning and Managing Electrical Transmission Corridors and Assets
Wednesday, July 16, 2014
1:30 – 2:45 p.m., Room 24A

Why Corridors?

- New transmission lines add reliability, relieve congestion, and facilitate renewable energy development
- Designating corridors:
  - Addresses many planning concerns in advance
  - Collocating projects helps reduce the number of separate routes
  - Process for inter-agency and inter-jurisdictional coordination

- Need for electrical transmission is complex and dynamic
  - Some factors reduce the need for new transmission
    - Rooftop solar
    - Smart grid
    - Efficiency improvements
    - Lower natural gas prices (trend to build gas turbines close to load centers)
  - Some factors increase the need for new transmission (and where it is needed)
    - New utility-scale solar and wind power plants

Energy Policy Act of 2005 (EPAct)

- Section 368(a): Directs Secretaries of Interior, Agriculture, Defense, Commerce, and Energy ("Agencies") to:
  - Designate energy corridors on federal land in 11 western states (Interior and Agriculture designated in 2009)
  - Perform environmental reviews
  - Incorporate designated corridors into land use plans
- Section 368(b): Directs Agencies to:
  - Identify Energy Corridors on federal land in the remaining 39 states and to designate, and incorporate the corridors into the applicable land use plans (no corridors were designated)
  - Schedule prompt action to identify, designate, and incorporate the corridors into the applicable land use plans

June 2013 Presidential Memorandum

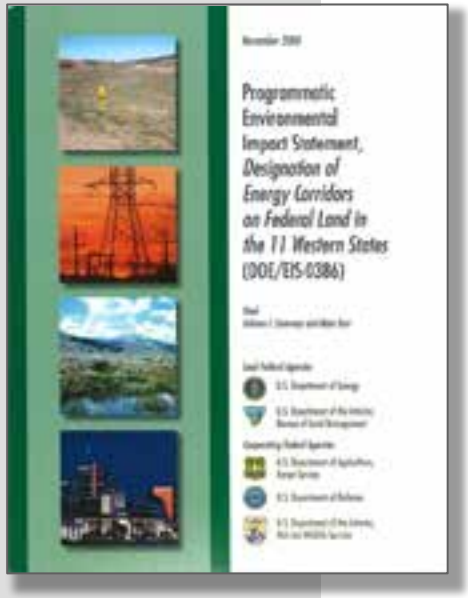
- Directs Secretary of Energy to create a Transmission Corridor assessment report in two parts that provides recommendations on upgraded and new electric-transmission and distribution facilities to improve reliability, relieve congestion and enhance the capability of the national grid.
- The Secretaries shall continue to evaluate designated energy corridors to determine the necessity for revisions deletions or additions[1].
- Secretaries of Interior and Agriculture are to coordinate a plan to evaluate corridors, propose implementation of changes and provide it to the steering committee[2].

[1]Each Secretary can designate corridors on land administered by their agency or bureau.

[2](i) the Department of Defense; (ii) the Department of the Interior; (iii) the Department of Agriculture; (iv) the Department of Commerce; (v) the Department of Transportation; (vi) the Department of Energy; (vii) the Department of Homeland Security; (viii) the Environmental Protection Agency; (ix) the Advisory Council on Historic Preservation; (x) the Department of the Army; and (xi) such other agencies or offices as the CPO may invite.

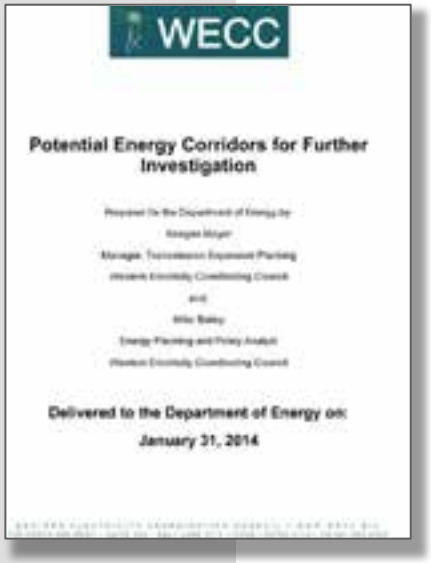
Timeline for 368(a) (West)

- August, 2005 — Energy Policy Act (Section 368)
- November 2008 — Final West-wide Energy Corridor Programmatic Environmental Impact Statement à
- January 2009 — Bureau of Land Management (BLM) and US Forest Service (USFS) Records of Decision: Corridors Designated
  - BLM designated 5,000 miles of corridors
  - BLM amended 92 land use plans
  - USFS designated 990 miles of corridors
  - USFS amended 38 land use plans
- July 2009 — Lawsuit: *Wilderness Society, et al. v. United States Department of the Interior, et al.*
- July 2012 — Settlement Approved and Case Dismissed
  BLM and FS agreed to analyze use of designated corridors
  More progress is planned as funding is arranged



Timeline for 368(a) (West) Continued

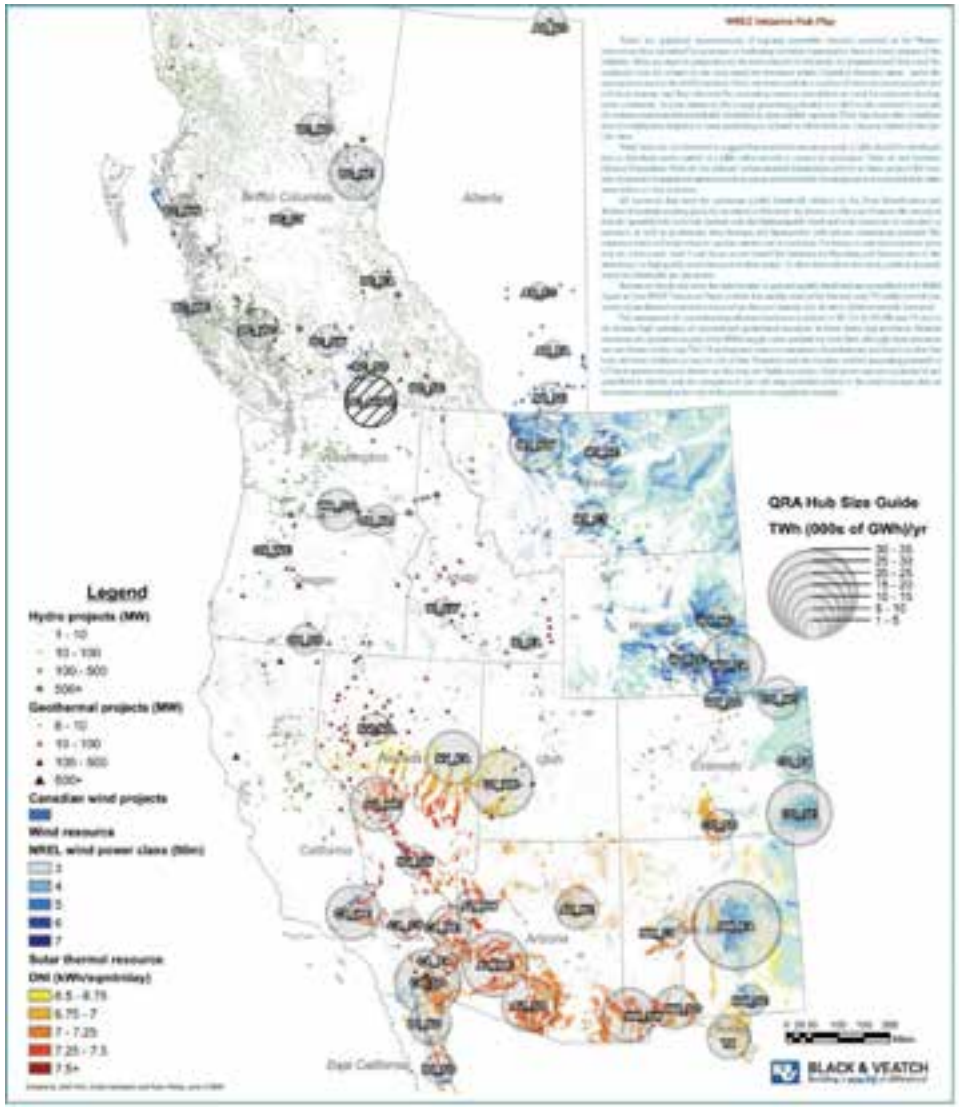
- June 2013 — Presidential Memo: *"The Secretary of Energy shall provide to the Steering Committee a Transmission Corridor Assessment Report"*
- June 2013 — Department of Energy request to Western Energy Coordinating Council (WECC) for corridor recommendations
- January 2014 — WECC Proposed Energy Corridors à
- February 2014 — Argonne analysis of WECC Proposed Energy Corridors à
- March 2014 — Request for Information: *"Agencies looking to determine best location and use of corridors on Federal lands in the West"*



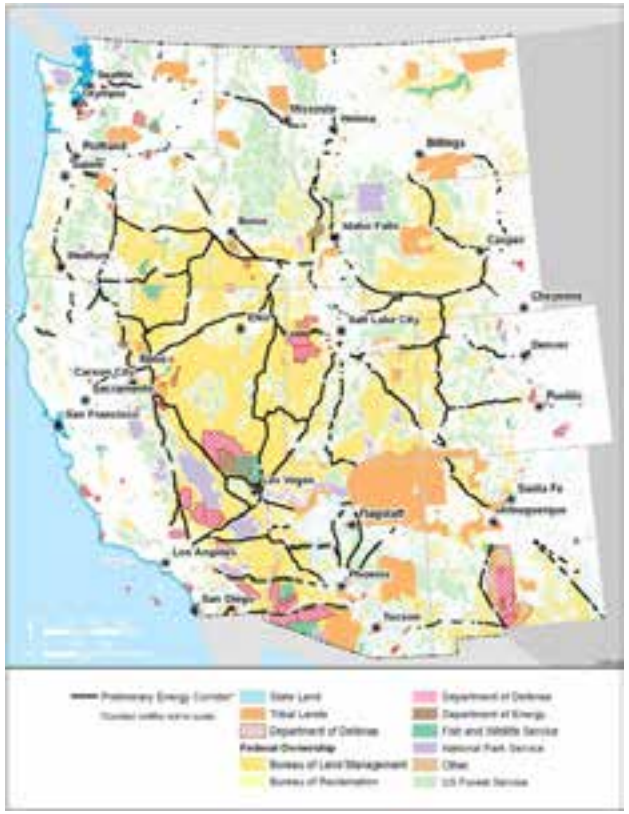
DOE Requested that WECC Develop an Updated Set of Potential Electricity Transmission Corridors

- Connect 6 load hubs to 13 Western Renewable Energy Zone hubs
- Includes 27 proposed corridors (centerline only)
- Total length of 10,182 miles
- Generated using least-cost route modeling
- Documented in WECC January 2014 report

The Hubs in the WECC Study were Derived from Centroids of the Western Renewable Energy Zones



A Part of the Argonne Report Compared the WECC Proposal to the Designated Corridors

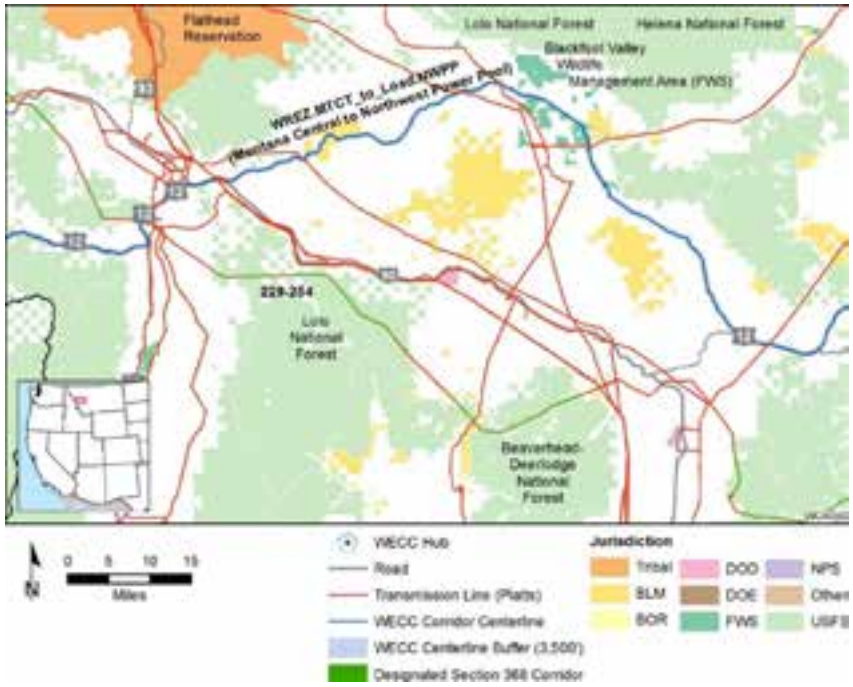


Designated Section 368 Corridors on Federal Land

Geospatial Database Used to Conduct Analyses

Proposed WECC Corridors

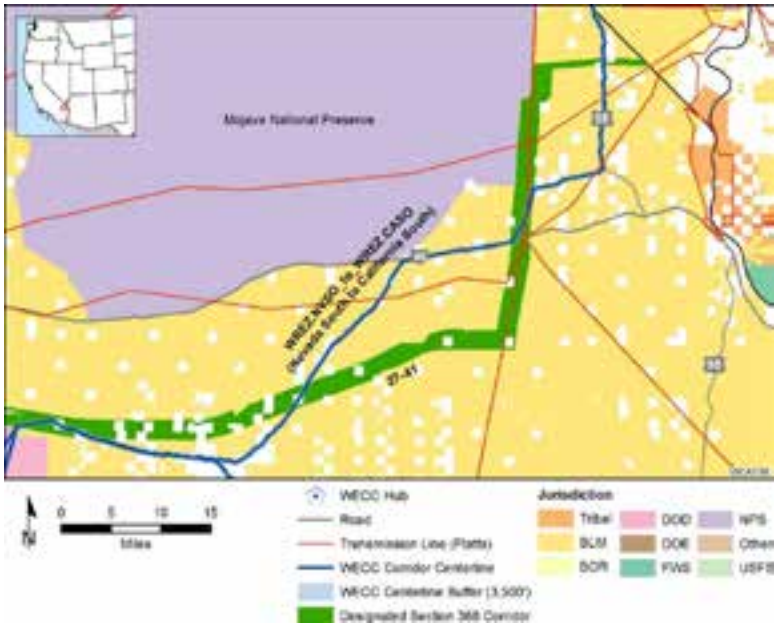
Example Results



- ß WECC Corridors (dark blue)
- Infrequently follow existing transmission lines and designated corridors
- WECC proposals sometimes traverse areas unlikely to be approved by the federal agency (see Blackfoot Valley)
- WECC proposals often used non-federal land (68% of WECC proposed corridors cross non-federal land)

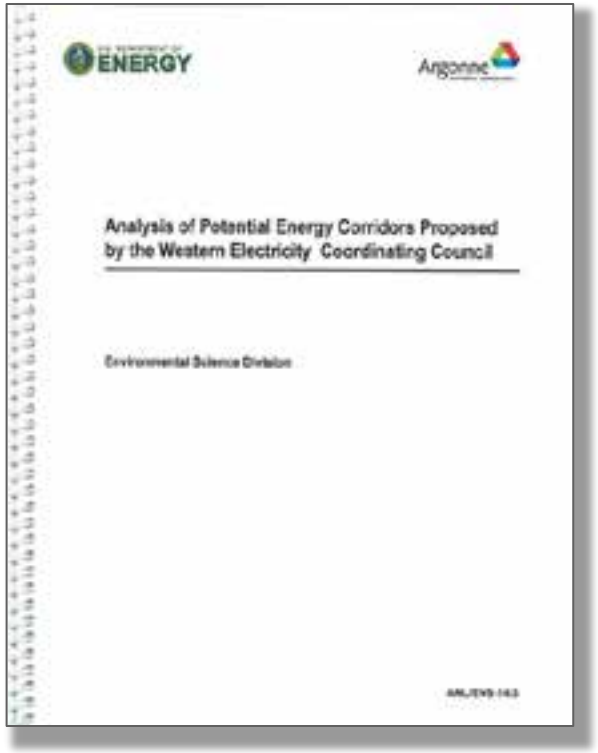
Some WECC corridors in the vicinity à of Section 368 corridors take different paths

One route is based on collaborative planning, one is based on modeling. Which is a better route and where are changes needed?



Conclusions of the Western Study by Argonne

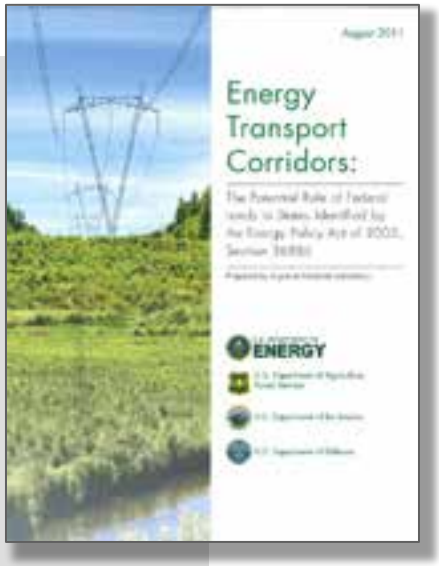
- Opportunity to combine the two efforts (designated Section 368 and WECC proposed corridors) and produce an effective system suited to more efficient acceptance and implementation
- The Request for Information provides a more complete opportunity for participants to propose new corridor locations, and for the agencies to update designated corridors in the West
  - Responses were due May 2014
  - Will help in development of the Section 368 Corridor Study and provide a foundation for the initial Regional Periodic Review
- Proposed WECC corridors cross lands administered by some agencies unlikely to designate corridors, such as the Department of Defense, National Park Service, and Fish and Wildlife Service



- Proposed WECC corridors have less emphasis on following existing transmission lines:
  - ~5% of WECC corridors on existing transmission, vs.
  - ~66% of designated Section 368 corridors
- GIS database provided with report

Timeline for 368(b) (East)

§ August, 2005	Energy Policy Act (Section 368)
§ October 2008	Advance Notice of Intent (ANOI) Limited response to ANOI received Agencies commission study
§ August 2011	Report to Congress à Context and scope of energy transport issues and their relationship to federal lands.
§ June 2013	Presidential Memo
§ March 2014	Argonne analysis of transmission lines and trails à

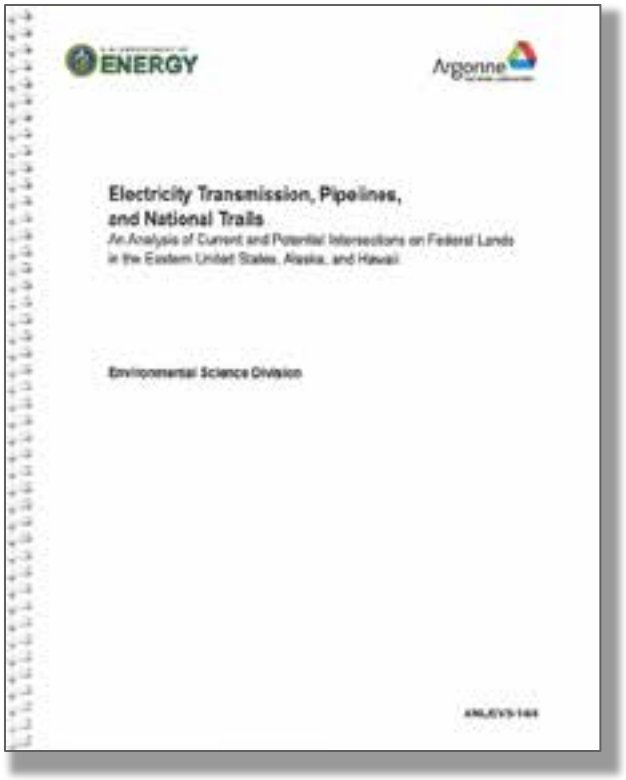


Why a Different Approach in the East?

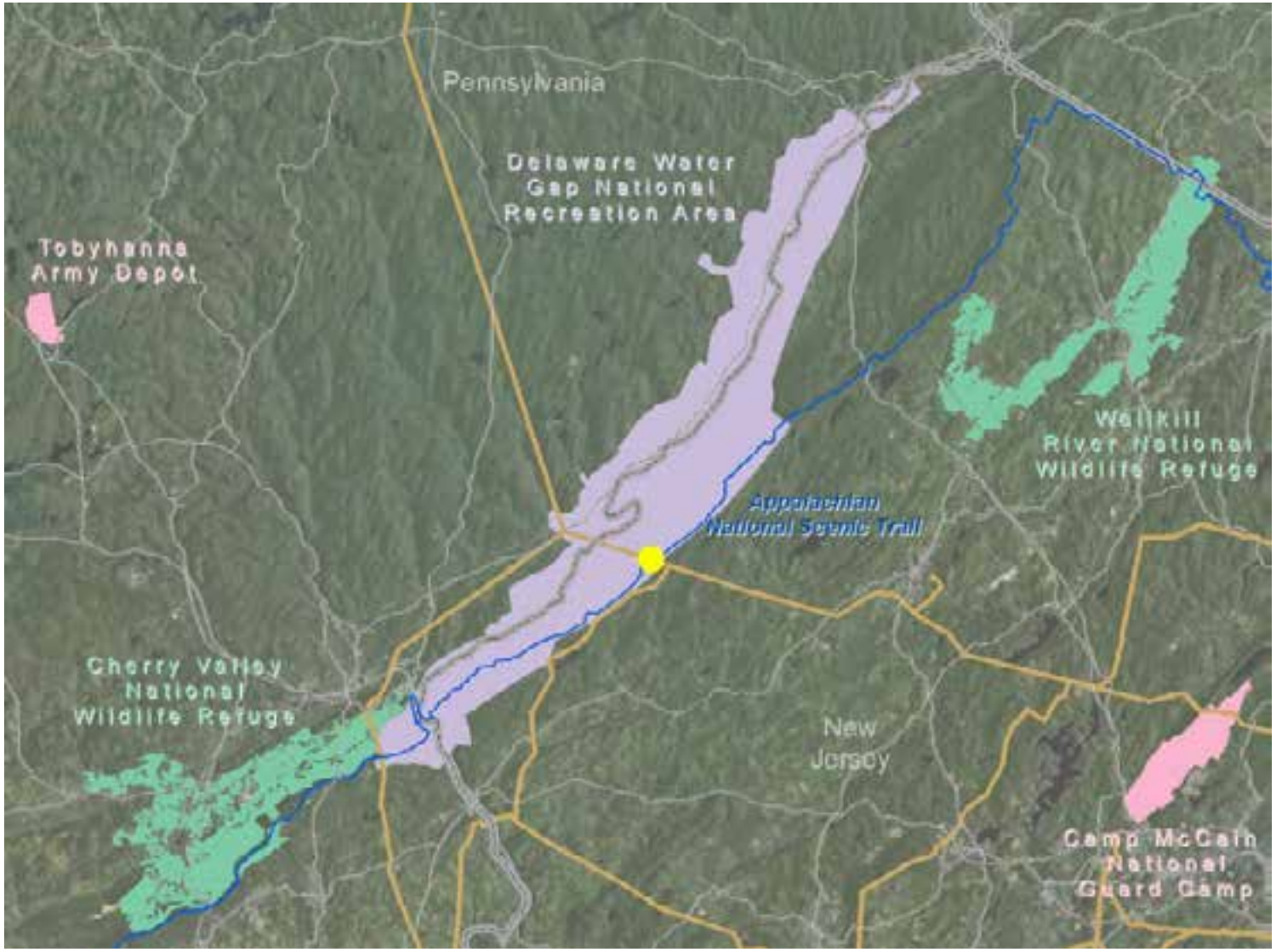
- Federal government context, but…
- The proportion of federal land is much lower in the East
- Significant challenges remain where planned transmission lines and pipelines would need to cross a National Historic or Scenic Trail

Analysis of Electrical Transmission Lines and National Trails in the Eastern United States

- More than twenty federally protected National Trails pose a potential obstacle to the development of new or expanded electricity transmission capacity in the eastern U.S.
- Potential problem is not well-documented and baseline information is needed
- Tasks for the study:
  - Analyze "footprint" of National Historic and Scenic Trails and the electricity transmission system in the 37 eastern contiguous states, Alaska, and Hawaii
  - Assess how national trails are affected by electrical transmission
  - Investigate near-future planned transmission lines
  - Includes pipelines and potential for collocation with electrical transmission lines



Example Result:
Delaware Water Gap National Recreation Area and Appalachian National Scenic Trail



Results for the Eastern Study

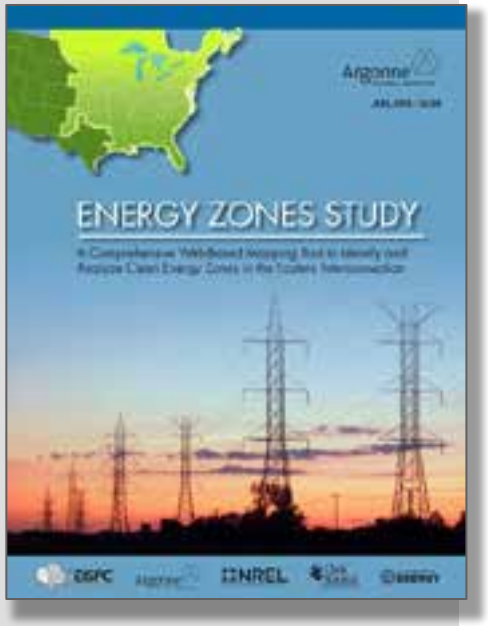
- 1,328 existing national trail intersections with high-voltage transmission
- 168 proposed transmission line intersections
- 101 existing transmission line intersections on federal land
- 20 proposed transmission line intersections on federal land
- 10,000 existing transmission line miles within 2.5 miles of national trails
- 1,200 proposed transmission line miles within 2.5 miles of national trails

– Study bounds the number, locations, and extent to which intersections between high-voltage electrical transmission lines and national trails occur

– GIS database provided with report

Related Timeline for the East

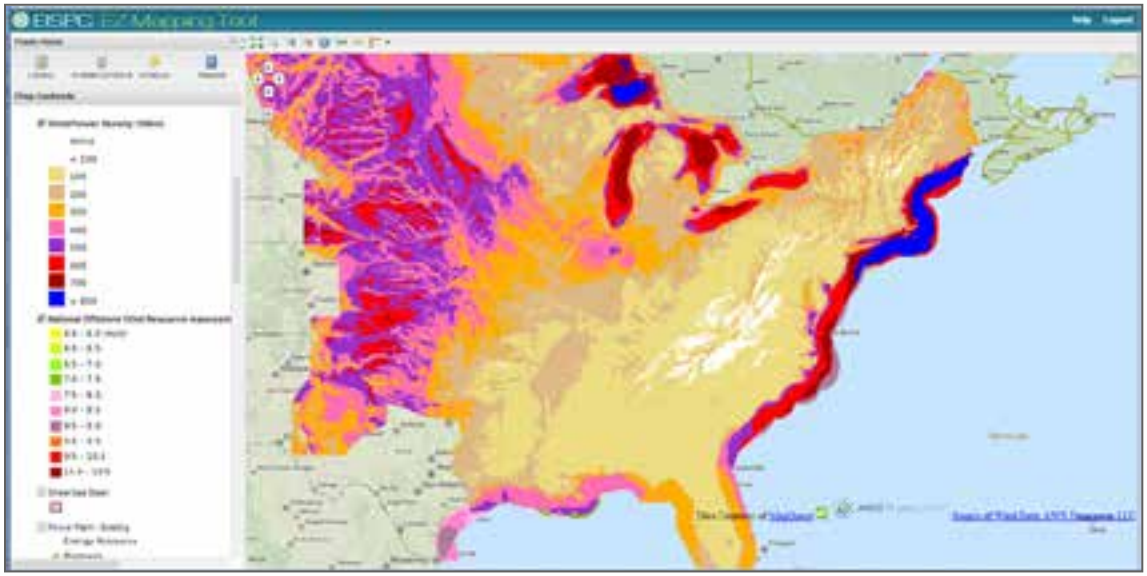
- December 2009 — DOE Funds 5 Efforts:
  - 2 Western Interconnection awards
  - 1 ERCOT [Texas]
  - 2 Eastern Interconnection awards
    (EISPC - Eastern Interconnection States' Planning Council, and EIPC – Eastern Interconnection Planning Collaborative)
- September 2011 — Labs tasked for Energy Zone Study (Argonne, NREL, ORNL)
- March 2012 — Initial version of EISPC Energy Zones Mapping Tool (EZMT) Launched
- January 2013 — Corridor report tool added to scope
- April 2013 — EISPC Energy Zones Mapping Tool made public
- September 2013 — End of Energy Zone Study; Final Report à
- July 2014 — Argonne funded to support whitepaper about EZ Mapping Tool and add corridor routing capability



EISPC EZ Mapping Tool Is Publicly Available

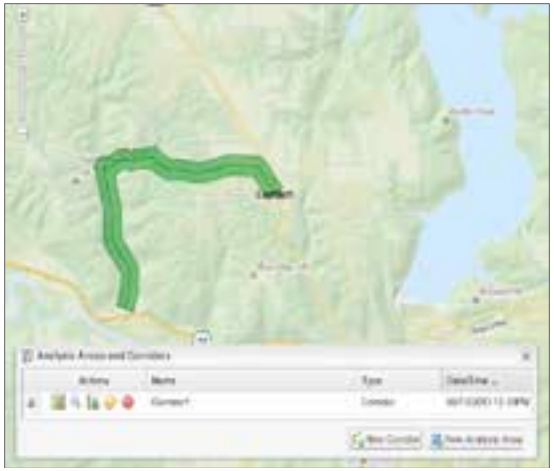
- The EZ Mapping Tool provides…
  - Data (>260 mapping layers)
  - Models (37 suitability models)
  - Reports (19 reports)
  - Policy information (>2,400 policies)

  …for nine clean (low- or no-carbon) energy resource categories in the Eastern Interconnection
- http://eispctools.anl.gov



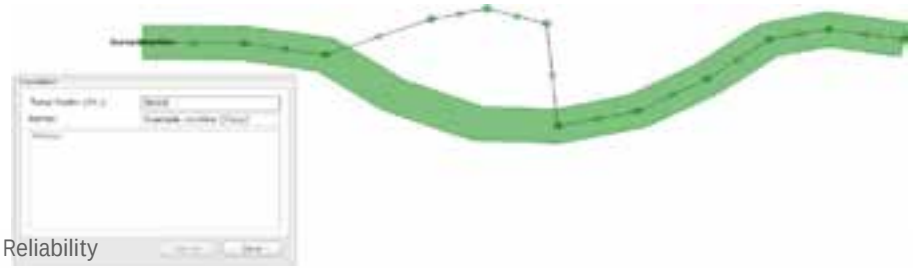
Corridor Screening Analysis

- User can draw a corridor path on the map
- Corridor report includes various information, listed by milepost along the centerline:
  - States and counties
  - Populated places
  - Elevated profile
  - Topographic slope
  - Major roads
  - Railroads
  - Rivers
  - Water bodies
  - Electrical substations
  - Pipelines
  - Military installations
  - Airports
  - Estimated peak horizontal ground acceleration
  - Protected lands
  - Habitat
  - Imperiled species
- Alternate paths can be investigated



States and Counties Crossed, by Milepost

From Milepost (mi)	To Milepost (mi)	State Name	County Name	Area Within Corridor (sq mi)
0.00	10.21	Indiana	Rush	0.06
10.21	31.25	Indiana	Decatur	0.10
31.25	39.50	Indiana	Jennings	0.06
39.50	57.69	Indiana	Ripley	0.19
57.69	78.60	Indiana	Dearborn	0.17
78.60	93.82	Indiana	Franklin	0.14
93.82	94.29	Indiana	Union	0.00
TOTAL				0.74



Sample Corridor Report Content

EISPC EZ Mapping Tool

Generated by the EISPC Energy Zone Mapping Tool
[illegible]
[illegible]

Corridor Report

Corridor Analyzed: IL test corridor

The corridor starts at [illegible] and ends at [illegible].
The centerline length is 154.12 miles long.
The [illegible] width results in a total area of [illegible] square miles.

States and Counties Crossed, by Milepost

From Milepost (mi)	To Milepost (mi)	State Name	County Name	Area Within Corridor (sq mi)
0.00	6.26	Illinois	Warren	[illegible]
6.26	24.26	Illinois	Knox	[illegible]
24.26	34.66	Illinois	Stark	[illegible]
34.66	51.82	Illinois	Peoria	[illegible]
51.82	57.16	Illinois	Marshall	[illegible]
57.61	79.81	Illinois	Woodford	[illegible]
79.81	115.96	Illinois	Livingston	[illegible]
115.95	131.75	Illinois	Ford	[illegible]
131.75	152.82	Illinois	Iroquois	[illegible]
152.82	154.12	Indiana	Newton	[illegible]
TOTAL				[illegible]

Source: U.S. Census Bureau [illegible]

Populated Places

From Milepost (mi)	To Milepost (mi)	Name	Type	Area Within Corridor (sq mi)
[illegible]	[illegible]	[illegible]	village	[illegible]
[illegible]	[illegible]	[illegible]	village	--
[illegible]	[illegible]	[illegible]	village	--
[illegible]	[illegible]	[illegible]	city	[illegible]

Elevation Profiles

Min Elevation: [illegible] Max elevation: [illegible]

From Milepost 0.0 to Milepost 10.0
Elevation (ft): Min = [illegible], Max = [illegible] | Topographic Slope (percent): Min = [illegible], Mean = [illegible], Max = [illegible]

From Milepost 10.0 to Milepost 20.0
Elevation (ft): Min = [illegible], Max = [illegible] | Topographic Slope (percent): Min = [illegible], Mean = [illegible], Max = [illegible]

Estimated Peak Horizontal Ground Acceleration with 10% Probability of Exceedance in 50 Years

From Milepost (mi)	To Milepost (mi)	Minimum Peak Horizontal Acceleration (%g)
0.00	154.12	2 - 3

Source: U.S. Geological Survey [illegible]

Mapping Color	Recommendation
Red	Preclude from development
Orange	Develop with extreme caution
Yellow	Develop with caution

Protected Lands

From Milepost (mi)	To Milepost (mi)	Recommendation	Percent
0.0	10.0	No issues identified in data	100.00%
10.0	20.0	No issues identified in data	[illegible]
		Preclude from development	[illegible]
20.0	30.0	No issues identified in data	[illegible]
		Preclude from development	[illegible]
30.0	40.0	No issues identified in data	100.00%
40.0	50.0	No issues identified in data	100.00%

Habitat

From Milepost (mi)	To Milepost (mi)	Recommendation	Percent
0.0	10.0	No issues identified in data	[illegible]
		Develop with extreme caution	[illegible]
10.0	20.0	No issues identified in data	[illegible]
		Develop with caution	[illegible]
20.0	30.0	No issues identified in data	[illegible]
		Develop with caution	[illegible]
30.0	40.0	No issues identified in data	100.00%
40.0	50.0	No issues identified in data	[illegible]
		Develop with caution	[illegible]
		Develop with extreme caution	[illegible]
50.0	60.0	No issues identified in data	[illegible]

Imperiled Species

From Milepost (mi)	To Milepost (mi)	Recommendation	Percent
0.0	10.0	No issues identified in data	100.00%
10.0	20.0	No issues identified in data	100.00%
20.0	30.0	No issues identified in data	100.00%
30.0	40.0	No issues identified in data	100.00%
40.0	50.0	No issues identified in data	[illegible]
		Develop with extreme caution	[illegible]
50.0	60.0	No issues identified in data	[illegible]
		Develop with caution	[illegible]
		Develop with extreme caution	[illegible]

Technical Progress in Corridor Planning

1. West-wide Energy Corridor PEIS
   - Large inter-agency planning process
   - Corridors planned based on:
     - Scoping data
     - Inter-agency workshops using GIS
     - Inter-agency webinars using GIS
   - No modeling of routes
2. WECC Study
   - Corridors routed between established hub centroids
   - Based on multi-criteria cost surface and least-cost path modeling
   - Requested by DOE; did not include inter-agency review and revision cycles
   - Followed by inter-agency call for additional corridor proposals
3. Addition of corridor routing tool to EISPC Energy Zones Mapping Tool
   - Publicly-accessible data and models – same for all stakeholders
   - User-adjustable inputs to models will allow generation of corridor alternatives
   - Will enable both collaborative planning and route modeling

Also: Methodology for analyzing and mitigating visual impacts is becoming better understood by the agencies when considering transmission proposals

Conclusions

- Federally administered land continues to play a significant role in the development of new energy transmission, especially electricity transmission in the western U.S.
- Fully developing reduced carbon electricity generation will require transmission access to federal lands
- The WECC corridor study and the Request for Information provide a more complete opportunity for participants to propose new corridor locations, and for the agencies to update designated corridors in the West
- Opportunities now exist to partner with stakeholders *at an analytical level* to improve transmission planning and access on federal lands
- DOE and its Federal Agency partners now have the databases and analytical tools to work effectively with stakeholders in developing more robust, open energy infrastructure planning
- There appear to be opportunities to designate federal land "gateways" allowing transmission crossings of National Trails

Resources

- Energy Policy Act of 2005: https://www.govtrack.us/congress/bills/109/hr6#
- Presidential Memorandum: *Transforming our Nation's Electric Grid through Improved Siting, Permitting, and Review* at http://www.whitehouse.gov/the-press-office/2013/06/07/presidential-memorandum-transforming-our-nations-electric-grid-through-i
- West-wide Energy Corridor Programmatic Environmental Impact Statement http://corridoreis.anl.gov
- *Western Electricity Coordinating Council: http://www.wecc.biz*
- *Analysis of Potential Energy Corridors Proposed by the Western Electricity Coordinating Council* (ANL/EVS-14/3) http://www.osti.gov/scitech/biblio/1130390
- *Electricity Transmission, Pipelines, and National Trails. An Analysis of Current and Potential Intersections on Federal Lands in the Eastern United States, Alaska, and Hawaii (*ANL/EVS-14/4) http://www.osti.gov/scitech/biblio/1130391
- Eastern Interconnection States' Planning Council (EISPC): http://eispc.org
- EISPC Energy Zones Mapping Tool: http://eispctools.anl.gov

Questions?

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- Questions?